Bimaxillary Prognathism in the Nubian People of Egypt

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A study of facial pattern and occlusion in Egyptian Nubian children. Skeletal pattern is found to be very similar to that of White Americans, with a more protrusive dentition situated farther forward in the face.

The dentition of a typical Egyptian Nubian is characterized by a Class I molar relationship with the cuspids and bicuspids nearly end-to-end, bimaxillary protrusion with moderate overjet and overbite, lower incisor crowding, and maxillary incisor spacing (Fig. 1).

Cephalometrically, the Nubian skeletal pattern is similar to that of White Americans as exemplified in the cephalometric norms of Steiner, Ricketts, Downs and Tweed, but with a greater dental protrusion (Walker, Harris and Kowalski, 1975, and Baughman and Bookwalter, 1977).

The analysis of Nubian tooth measurements by Harris, Aboul Azm, and Nasjleti in 1979 showed that the teeth are similar to those of American Whites. The most notable differences were smaller first molars and maxillary cuspids, the larger maxillary lateral incisors, all of marginal significance (Table 1).

The purpose of this study is to investigate the accommodation of that dental prognathism within an otherwise typical Caucasian form of craniofacial skeleton.

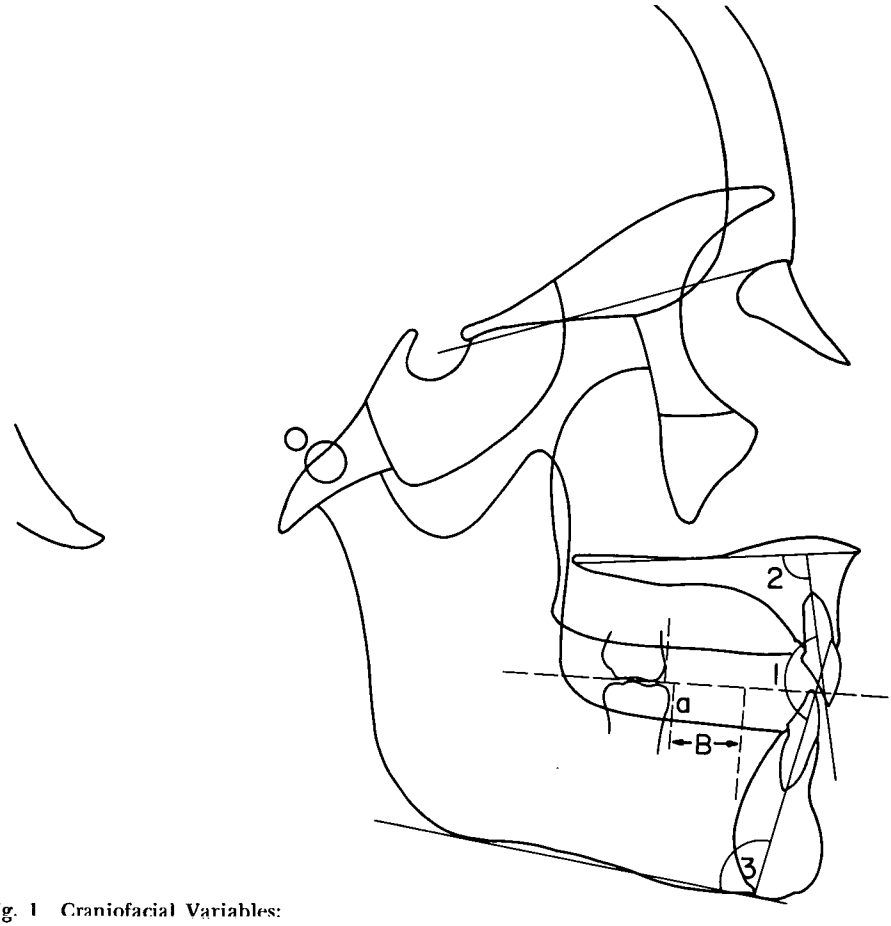

Fig. 1 Craniofacial Variables:
1. Interincisal angle
2. Max. Incisor-palatal angle
3. Mand. Incisor-mandibular plane angle

a) The difference between the mesial surfaces of the maxillary and mandibular molars measured on the occlusal plane in mm.
B) The distance between the mesial surface of the mandibular first molar and the mandibular symphysis measured in mm.

TABLE 1
Means of Tooth Width

	Nubians	*Americans*	*Significance*
Max Lateral	6.79	6.98	.00
Max. Cuspid	7.84	7.95	.01
Max. 1st. Molar	10.34	10.51	.00
Mand. 1st. Molar	11.11	11.29	.00

Material and Methods

Subjects

Fifty-four lateral cephalometric radiographs of Nubian school children were divided into subsamples of 27 males and 27 females. All of the subjects were between 14 and 17 years of age. Lateral cephalometric films of 55 American children, 27 males and 28 females, in the same age range as the Nubian children, were also selected for comparison. All subjects had a

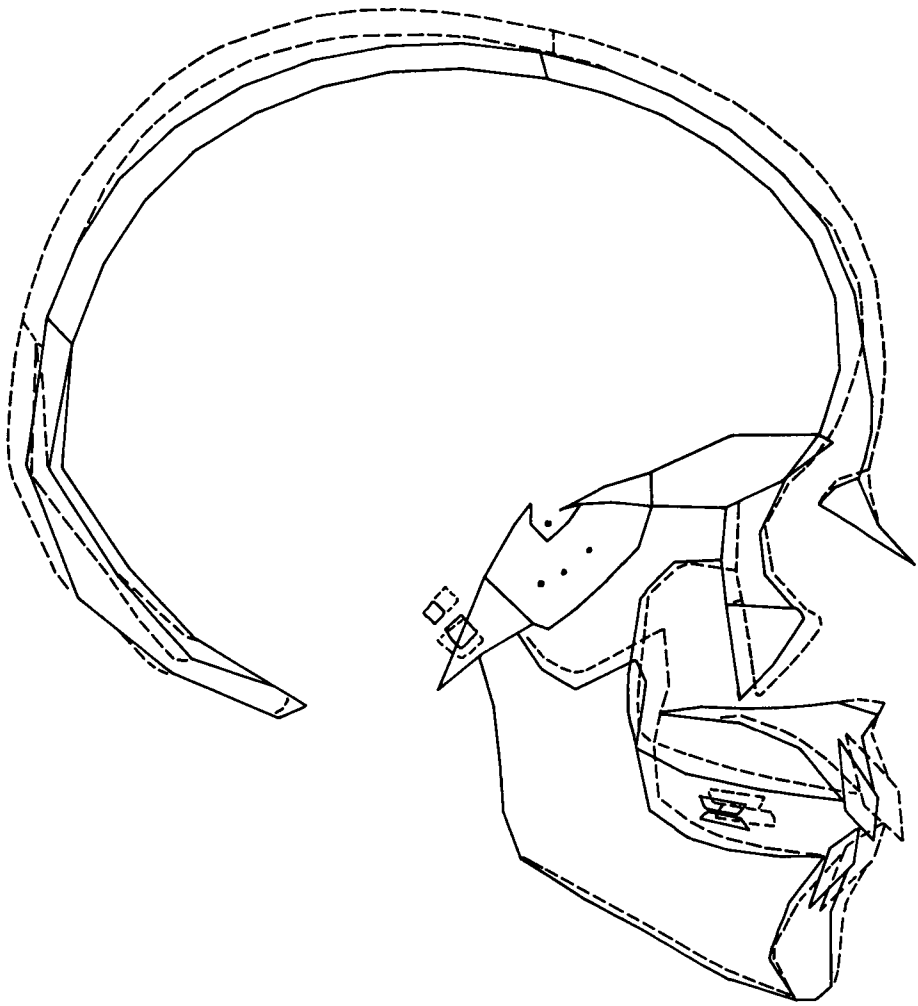

Fig. 2 The Computer plots (Walker's method) comparing the craniofacial skeleton of the Nubian sample (dotted line) with that of the American sample (solid line).

Class I molar relationship with a moderate overbite and overjet.

Measurement

The radiographs were traced on frosted acetate, then scanned and digitized according to the method described by Walker, 1967 and 1977, and Walker and Kowalski, 1972 (Fig. 2). The following angular and linear measurements were used to evaluate the relationship of the dentition to the craniofacial skeleton (Fig. 3).

Angular Measurements:

1. Interincisal angle.
2. Maxillary central incisor to the palatal plane.
3. Mandibular incisor to the mandibular plane (IMPA).

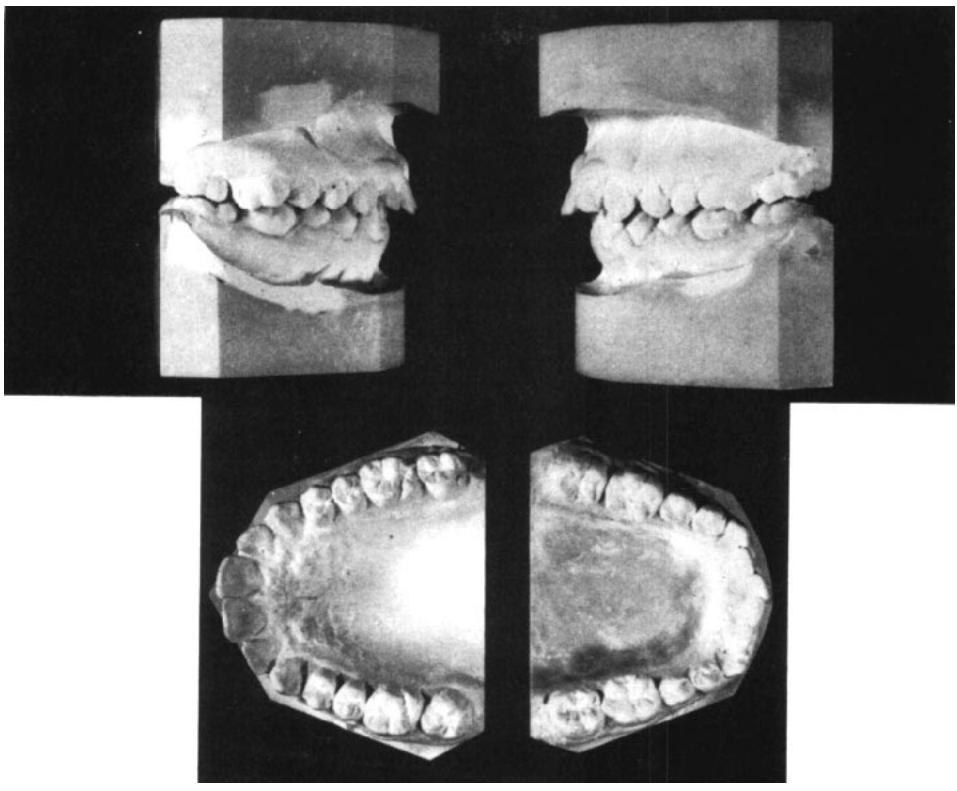

Fig. 3 Dental casts of a typical Nubian. Note the mandibular anterior crowding and the maxillary anterior spacing.

Linear Measurements:

A. Mesiodistal distance between the mesial surfaces of opposing maxillary and mandibular molars.
B. Mesiodistal distance between the mandibular first molar and the lingual surface of the mandibular symphysis, measured between perpendiculars erected to the occlusal plane.

Statistical Analysis

Statistical analyses were used to provide means, range and standard deviations of all variables for each of the four groups.

Histograms confirmed an essentially normal distribution of the variables studied. Differences between the means of each of the four groups (Nubian males, Nubian females, American males, and American females) were evaluated with Student's t-test.

Only linear measurements were used to measure the degree of separation between the Nubian and American samples, since the angular values were so obviously different. Stepwise discriminate function analysis (Dixon, 1968) was used, permitting entry or removal of one variable at each step (significant at the 5% level).

TABLE 2

Variable	*Mean*	*S.D.*	*Mean*	*S.D.*	*Significance*
	Nubian $N = 54$		*American* $N = 55$		
UI-LI	114.7	7.0	131.1	6.7	.00
UI-Ppl	117.9	4.3	112.5	5.8	.00
LI-Mpl	98.7	5.8	94.8	5.3	.00
UM-LM	2.0	0.7	8.5	2.1	.00
LM-Sym.	6.5	2.2	8.5	2.1	.00
	Nubian males $N = 27$		*American males* $N = 27$		
UI-LI	112.9	7.1	131.1	7.0	.00
UI-Ppl	118.2	4.3	110.6	7.0	.00
LI-Mpl	98.5	6.5	94.8	5.7	.03
UM-LM	2.2	0.7	1.3	0.5	.00
LM-Sym.	6.7	2.3	9.5	1.3	.00
	Nubian females $N = 27$		*American females* $N = 28$		
UI-LI	116.5	6.6	130.0	6.2	.00
UI-Ppl	117.6	4.4	114.3	3.7	.00
LI-Mpl	98.9	5.1	94.9	5.0	.01
UM-LM	1.9	0.6	1.0	0.5	.00
LM-Sym.	6.3	2.0	7.4	2.2	.05

Findings

The craniofacial skeleton and the size of the teeth were not significantly different between the Nubian and American samples, but the occlusion of the dentition was markedly different (Table 2). A prognathic dentition, Class III molar relationship, lower dental crowding and maxillary anterior spacing are all typical.

Unique characteristics of the Nubian Dentition are:

Mandibular—

1. Molar closer to symphysis
2. Crowded anterior teeth
3. Procumbent incisors

Maxillary—

4. Spacing of anterior teeth
5. Procumbent incisors

Intermaxillary—

6. Lower first molar about 2 mm mesial to upper
7. A functional bimaxillary protrusion

Discussion

The Egyptian Nubian population represents a very ancient gene pool extending back to predynastic Egypt and the beginnings of civilization (Hertzog, 1957, Carlson and Dennis, 1968, and Harris, Ponitz and Loutfy, 1970). Although there has been racial admixture throughout the long history of the Nile valley, the investigations of Adams (1966), Carlson and Dennis (1968), and Harris and Shehata suggest that the craniofacial

skeleton of the Nubian has remained remarkably unchanged over the last five thousand years.

The modern Nubians now living at Kom Ombo, Egypt have craniofacial skeletons similar to those of American whites.

The mesiodistal width of the teeth is not significantly different from *American samples. However, the dentition* is characterized by bimaxillary protrusion with incisors tipped labially, with a much smaller interincisal angle. The smaller distance from the mandibular first molar to the lingual surface of the symphysis further demonstrates the more mesial position of the Nubian dentition on the skeletal substructure.

The slightly more mesial position of lower molars in relation to uppers in the Nubians (Nubian Males 2.0 mm—American Males 1.3 mm) is related to the typical crowding of the mandibular anterior dentition and spacing of the upper incisors.

The discriminant analyses in Table 3 demonstrate the ability of the selected linear variables to correctly place individuals in the appropriate category of the sample; 81.5% of the Nubians and 98.1% of the Americans were correctly identified on the basis of these analyses.

Conclusion

Bimaxillary protrusion, which characterizes the Nubian population, reflects a forward position of the entire dentition. The mesial relationship of lower molars to upper (Class III tendency) is related to the lower incisor crowding and upper incisor spacing which is more common in the Nubians than in Americans.

The Nubian dentition is an excellent example of accommodation between seemingly disparate components.

TABLE 3

Discriminant Analyses: The boldface elements show the percentage of Nubians and Americans classified correctly using only the linear variables.

		Nubian	*American*
Nubian	54	44	10
Row %		**81.5**	18.5
American	55	6	49
Row %		10.6	**89.1**
		Nubian Males	*American Males*
Nubian Males	27	21	6
Row %		**77.8**	22.2
American Males	27	3	24
Row %		11.1	**88.9**
		Nubian Females	*American Females*
Nubian Females	27	21	6
Row %		**77.8**	22.2
American Females	28	5	23
Row %		17.9	**82.1**

References

Adams, W.: Post Pharonic Nubia. Journal of Egyptian Archeology, V. 52, 1966.

Baughman, G. and Bookwalter, Roger: The Craniofacial Skeleton and Developing Dentition. Master Thesis University of Michigan, School of Dentistry, 1977.

Burnor, D. B. and Harris, J. E.: Racial Continuity in Lower Nubia: 12,000 B.C. to the Present. Proceedings of the Indiana Academy of Science for 1967, Vol. 77, 1968.

Carlson, David S., Van Gernver, Dennis: Masticatory Function and Post-Bleistocene Evolution in Nubia. Am. J. Phys. Anthrop., 46:495-506, No. 3, 1977.

Dixon, W. L.: Biomedical Computer Program BMD.

Harris, J. E., Ponitz, P. V. and Loutfy, M. S.: Orthodontics Contribution to UNESCO'S Campaign to Save the Monuments of Nubia: A 1970 Field Report. Amer. J. of Orthod., Vol. 58, No. 6, pp. 578-596, December 1970.

Harris, J. E., Aboul Azm, S., Nasjleti, C.: Tooth Size and Malocclusion in Egyptian Nubian. IADR Abstract, Vol. 58:A, Jan., 1979.

Herzog, Rolf: Die Nubiez, Berlin 1957, Deutsche Akademie der Wissenschaft, Volkerkundische Forschunger 2.

Harris, J. E. and Shehata, Fathy I.: An unpublished paper.

Walker, G. F.: Summary of a Research Report on the Analysis of Craniofacial Growth. New Z. Dental Journal 63:61, 1967.

Walker, G. F., and C. J. Kowalski: Computer Morphometrics in Craniofacial Biology. Computer Biol., Med. 2:235-269, 1972.

Walker, G. F.: A New Approach to Analysis of Craniofacial Morphology and Growth. Am. J. Orthod., 61:221-30, 1972.

Walker, S. J., Harris, J. E. and Kowalski, C. J.: SNA and SNB Angles in a Population of Nubian Schoolchildren. J. Dental Res., Vol. 54, No. 4, pp. 764-766, ADA, 1975.